CLAIMS

1. A control device for an internal combustion engine, the control device comprising:

fuel cut means for cutting off fuel when the internal combustion engine decelerates;

EGR control means for providing a larger exhaust gas recirculation amount during fuel cut at a high engine speed than during fuel cut at a low engine speed; and

intake air amount control means for providing a smaller intake air amount during fuel cut at a high engine speed than during fuel cut at a low engine speed.

2. The control device according to claim 1, further comprising:

actual EGR judgment means for judging whether an actual value of the exhaust gas recirculation amount is greater than a judgment value,

wherein the intake air amount control means includes control delay means, which waits until the actual value of the exhaust gas recirculation amount exceeds the judgment value after the start of fuel cut at a high engine speed, before beginning to exercise control so as to reduce the intake air amount.

3. The control device according to claim 2, further comprising:

a variable valve mechanism that can vary a valve overlap period during which an intake valve open period overlaps with an exhaust valve open period,

wherein the EGR control means includes VVT control means, which drives the variable valve mechanism to adjust an internal exhaust gas recirculation amount; and

wherein the actual EGR judgment means determines according to the status of the variable valve mechanism whether the actual value of the exhaust gas recirculation amount is greater than the judgment value.

4. The control device according to claim 2 or 3, wherein the intake air amount control means includes means that maintains a larger intake air amount than at the beginning of fuel cut during the time interval between the instant at which fuel cut begins at a high engine speed and the instant at which the actual value of the exhaust gas recirculation amount exceeds the judgment value.

5. The control device according to any one of claims 1 to 4, further comprising:

actual EGR judgment means for judging whether the actual value of the exhaust gas recirculation amount is greater than the judgment value; and

fuel cut function disable means for disabling a fuel cut function during the time interval between the instant at which a fuel cut execution condition is established and the instant at which the actual value of the exhaust gas recirculation amount exceeds the judgment value.

6. The control device according to claim 5, further comprising:

fuel cut function enable means for enabling the fuel cut function when a fuel cut function disable limit period elapses after fuel cut execution condition establishment.

7. The control device according to any one of claims 1 to 6, further comprising:

throttle opening angle electronic control means for electronically controlling a throttle opening angle in accordance with an accelerator opening angle,

wherein the fuel cut means determines according to the accelerator opening angle whether the fuel cut execution condition is established.

8. The control device according to any one of claims 1 to 7, further comprising:

increased EGR amount canceling means, which, when fuel cut has continued for a predetermined period of time, cancels the increased amount for correction purposes of the exhaust gas recirculation provided by the EGR control means; and

decreased amount canceling means, which, when fuel cut has continued for the predetermined period of time, cancels the decreased amount for correction purposes of the intake air provided by the intake air amount control means.

9. The control device according to claim 8, further comprising:

continuation time judgment means, which, when it is estimated that a catalyst positioned in an exhaust path of the internal combustion engine fully occludes oxygen after the start of fuel cut, judges that fuel cut has continued for the predetermined period of time.

10. The control device according to claim 9, wherein the catalyst contains an upstream catalyst and a downstream catalyst, which are serially arranged, and includes a downstream oxygen sensor, which is positioned downstream of the upstream catalyst; and wherein the continuation time

judgment means includes air amount cumulating means, which calculates a cumulative intake air amount that is reached since the downstream oxygen sensor begins to generate a lean output after the start of fuel cut, and judgment means, which, when the cumulative intake air amount reaches a value for causing the downstream catalyst to fully occlude oxygen, judges that fuel cut has continued for the predetermined period of time.

11. The control device according to claim 10, further comprising:

upstream oxygen storage capacity detection means for detecting the oxygen storage capacity of the upstream catalyst; and

setup means, which sets the value for causing the downstream catalyst to fully occlude oxygen in accordance with the oxygen storage capacity of the upstream catalyst.

12. The control device according to any one of claims 8 to 11, further comprising:

cooling purpose flow amount achievement means, which, when fuel cut has continued for the predetermined period of time, controls the intake air amount so as to invoke an intake air amount for cooling purposes, which is larger

than the amount prevailing before the start of fuel cut; and

flow amount change means, which, when the intake air amount for cooling purposes has been maintained for a predetermined cooling period during fuel cut, exercises control so that the intake air amount is larger than the amount prevailing before the start of fuel cut and smaller than the amount for cooling purposes.

13. The control device according to claim 12, further comprising:

catalyst temperature detection/estimation means for detecting or estimating the temperature of a catalyst positioned in an exhaust path of the internal combustion engine; and

cooling time setup means for setting the cooling period in accordance with the temperature of the catalyst.

14. The control device according to any one of claims 1 to 13, wherein the EGR control means includes an EGR adjustment mechanism, which operates to change the exhaust gas recirculation amount; operating speed detection means, which detects an operating speed of the EGR adjustment mechanism; and operating amount setup means, which sets an operating amount of the EGR adjustment

mechanism for a fuel cut period in accordance with the operating speed.

15. The control device according to claim 14, wherein the intake air amount control means includes reduction amount setup means, which ensures that a reduction amount for the intake air amount for a fuel cut period decreases with an increase in the operating amount.

16. The control device according to claim 14 or 15, wherein the operating speed detection means detects the operating speed of the EGR adjustment mechanism in a region where an engine speed exceeds a judgment value.

17. The control device according to claim 16, wherein the operating speed detection means includes operating speed measurement means, which measures the operating speed of the EGR adjustment mechanism at an arbitrary engine speed; rotation speed storage means, which stores the engine speed when the operating speed is measured; and conversion means, which, in accordance with the engine speed prevailing when the operating speed is measured, converts the operating speed measured by the operating speed measurement means to an operating speed

within the region where an engine speed exceeds the judgment value.

18. The control device according to any one of claims 14 to 17, wherein the EGR adjustment mechanism is driven by a hydraulic pressure exerted by the internal combustion engine; and wherein the operating speed detection means includes operating speed measurement means for measuring the operating speed of the EGR adjustment mechanism at an arbitrary oil temperature, oil temperature storage means for storing an oil temperature prevailing when the operating speed is measured; oil temperature detection means for detecting an oil temperature at a predefined time; and conversion means for converting the operating speed measured by the operating speed measurement means to an operating speed at the predefined time in accordance with the oil temperature prevailing when the operating speed is measured and the oil temperature prevailing at the predefined time.

19. The control device according to claim 12, wherein the cooling purpose flow amount achievement means and the flow amount change means control the intake air amount by controlling a throttle opening angle or an idle speed control (ISC) valve flow rate.

20. The control device according to any one of claims 1 to 19, wherein the intake air amount control means controls the intake air amount by controlling the throttle opening angle or the idle speed control (ISC) valve flow rate.